DATA PROCESSING DIGEST

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MANAGEMENT SCIENCES

NAVY MANAGEMENT REVIEW, June 1959; pages 3-6, 19

Management problems are becoming more and more complex. This complexity implies the existence of many parts which are related among themselves, directly or indirectly. The proper resolution of these interrelationships is the most difficult of managerial decision making. In addition, management problems generally involve qualitative factors which are not susceptible to the familiar processes of precise physical measurement. For example: worker morale, customer satisfaction, good-will, growth potential, and military worth. Even if acceptable individual measures could be devised, the crucial problem of obtaining a common measure of all the factors involved would still remain. Another factor which complicates management decision making is the element of uncertainty.

Complex interrelationships. Because the human mind is incapable of resolving them intuitively, complex problems are generally simplified in some manner; and sometimes the simplification is effected unwittingly. For example, the practice of ignoring or disregarding apparently insoluble relationships is so ingrained that it is often erroneously deduced that there are only a few alternatives available. Another popular method of dealing with obscure interrelationships is to impose artificial restrictions or constraints. Probably the procedure most commonly used in resolving such problems is the assignment of priorities. This procedure is perfectly sound, if the priorities really reflect the conditions of the problem. However, this is very seldom the case. A typical weakness inherent in the priority approach is that it usually is not realized that the imposed priority structure is already the solution.

Lack of standards of measurement. Traditionally, this problem has been left to the intuitive talents of the executive. However, modern business complexes reflect such a maze of obscure interrelationships that the capacities of the human mind are simply overwhelmed. Ignoring a qualitative factor because of the difficulty of

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Qualitative factors are ignored if unmeasurable

measuring its significance often yields results which are unreasonable even on the basis of casual reflection. For example, the number of shortages in a supply system has often been used as a criterion of the efficiency of the system. This implies that the shortage of a pencil, say, is as important as the shortage of a capacitor essential to the operation of an air search radar. Obviously, it is much better to adopt even rough indices of relative worth and have them open to scrutiny, than to mask the significance of qualitative factors by seemingly ignoring them in the analysis, but de facto attaching, implicitly, non-scrutinized values to them.

Problem of uncertainty. The conventional rule of thumb for accommodating uncertainty is to incorporate flexibility into the management system. However, all too often uncertainty is assumed to be eliminated by the imposition of the "law of averages," and little attempt is made to relate provisions for flexibility with the nature and probable consequences of uncertainty. For example, inventory practice generally includes a provision termed "safety level," which denotes the quantity of an item retained as insurance against unusually high demands. Obviously, unless the variability in demand is known and measured in terms of probability, there is no way in which the risk assumed for any given stock item can be validly established.

Mathematics can define complexities

Mathematics is as useful in describing, relating, and resolving these complexities of management as it is in engineering and the physical sciences. It is true that many of the highly complex management problems cannot be entirely solved by existing mathematical methods. However, even if the complete problem may currently be beyond solution, it is usually true that a scientific analysis can provide partial solutions, which will provide executives with greater insight and a more rational basis for making decisions.

The use of mathematics in itself is no assurance of a good solution. There must be an objectivity of purpose and analysis, uncolored by preconceived notions as to what constitutes the problem, the method of solution, and what data are significant or not significant. Actually, the significance of the many factors which influence decisions can only be established when the relationship between the factors and the objectives is determined. The lack of emphasis in scientifically or objectively determining these relationships in a form accessible to analysis has probably been the greatest single short-coming of modern management.

First the relationships must be defined

The three broad steps which are necessary to resolve a problem are:

1. The significant factors which contribute to and limit the decision process must be identified.

2. The relationships among these factors must be realistically and accurately determined.

3. The procedures to resolve the relationships so as to

indicate the consequences of alternative decision possibilities must be determined.

The scientific approach

The novelty, if any, of the scientific approach, involves the use of the objectivity of the experimental scientists in performing Step 1; the use of mathematical language for Step 2; and the use of mathematical procedures for Step 3. Steps 2 and 3 may be accomplished without the use of mathematics for simple problems, but the proper analysis of any problem calls for complete objectivity in performing Step 1. In this step, many requirements may appear to exist, but in reality they may be based on tradition, customary methods of obtaining a solution, obsolete policies, or a lack of pertinent data. Also implicit in Step 1 is the need for a precise formulation of the over-all objective of the activity under study. When there are conflicts of sub-objectives, the conflict can only be resolved in terms of a higher level objective. Unless this higher level objective is clearly understood, there cannot be consistent decisions. General statements which include such words as "most efficient" or "most effective" may be useful for public relations purposes, but they are not adequate guides for management action. The scientific effort to identify and formalize the objective is not a usurpation of executive prerogatives. On the contrary, it is necessary in order to provide the executive with a reasonable number of alternatives so that he is able to render intelligent, consistent decisions.

A system which has been formulated scientifically and solved mathematically almost automatically implies a framework for an efficient information system as a by-product. However, control information derived from this system must be examined in the same critical manner as initial planning information. In a scientifically formulated system, the mathematical model provides a basis for determining the type of control information which should be obtained, and the mechanism for evaluating the information in terms of the objective.

TEACHING EXECUTIVES VIA SIMULATION

E. W. Martin, Jr., Indiana University
BUSINESS HORIZONS, Summer 1959; pages 100-109

Simulation, or management gaming is suggested as a method for training men for promotion from functional areas into higher management, and for training college students in management problems. In administering a game, it is necessary to define the "rules" for the participants, that is, orient them to the hypothetical situation they will face. The time allotted to the participants must be long enough for rational decision-making, but short enough to exert some pressure and to keep up the interest. To prevent participants from adopting unrealistic policies in anticipation of the game's ending, they should not be told exactly when it will end. At least five years of simulated decisions appears to be desirable. At the

Some rules for management gaming

rate of one year per hour, five hours of play spread over two or more shorter sessions will enable the students to assimilate the lessons learned in one session before beginning the next one.

The most important part of the experience is the evaluation session, during which the performance of the entire industry is discussed, and each team is required to present its objectives and policies to justify and explain its decisions and results.

Experience in use shows that students can see and evaluate the results of their decisions and learn through pseudo experience. It appears that the students learn more through their mistakes than through their successes. The same game may be used repeatedly, for, as the gross mistakes are eliminated, the competition becomes more intense, and the more subtle considerations become of paramount importance. The importance of well-defined objectives, rational and flexible policies, and the role of planning in management decision-making are clearly illustrated by the use of the management decision game. The student is forced to actively integrate knowledge of many areas into a framework so that their interrelationships become truly meaningful for the first time. Because the game is played in teams, each team must solve problems associated with organizing a group of individuals to accomplish a complex task under time pressure. Participants are frequently impressed with the importance of interpersonal relationships in group decision-making.

Advantages and disadvantages

Some of the limitations in management gaming, as applied to their use in colleges, are: the cost of operating a game (between $8 and $12 per participant per run); the tendency for the participants to approach it as a game, rather than as a realistic business situation; the lack of qualitative influences on the decisions (e.g. the skill of various advertising approaches); a tendency to formalize the rules of the game, rather than allow innovation as the game is played; and the possibility that the game will inadvertently teach the student principles that are invalid, because of the bias of information feedbacks, decision variable, or the mathematical relationships involved (e.g., that advertising is more effective than research and development).

Several games are described briefly. Reprints of the article may be ordered from Business Horizons.

DYNAMIC MANAGEMENT DECISION GAMES

Jay R. Greene, and Roger L. Sisson
Published by John Wiley & Sons, 1959. $2.95

Management gaming has been developing rapidly in several locations during the past few years. Several games have been publicized extensively, but others have been used only internally in

universities and business organizations. Most of these games have been based on the use of a computer to compute results for the participants, thus limiting the use of the games to those organizations where such facilities are available. The authors of this book, however, look upon management gaming as a splendid teaching device, and regret the lack of games which do not need elaborate equipment for playing. Hence their book. It consists of seven games in a variety of business situations, along with an explanation of the purpose and use of games as a training tool, and information on how to construct games for specific situations. The instructor or referee is given directions on how to conduct a game, and how to help the participants evaluate their performance. Each game has separate information for participants and referee, an explanation of the business situation or framework in which the game is set, and a set of the forms for both the players and the referee which are to be used with the game.

Seven games to be played without a computer

The games include: materials inventory, personnel assignment, retailing department, production scheduling, industrial sales, and top operating management games, none of which requires the services of a computer.

This is a practical and interesting book for the instructor (in university or in business) and for the student. Directions and explanations are detailed and clear. It fulfills a real need, to introduce people to the principles of management gaming easily and at modest cost.

The book is paper covered. We would prefer a case bound book because of the heavy usage such a book receives. It is hoped that future printings will eliminate this and other production shortcomings.

OPERATIONS RESEARCH METHODS AND PROBLEMS

Maurice Sasieni, Arthur Yaspan, Lawrence Friedman
John Wiley & Sons, Inc., 1959. $10.25

This is a textbook recommended for advanced study in OR techniques. It is geared to those with a working knowledge of differential and integral calculus. Except for the introductory chapter, each chapter contains the general theory and techniques of a problem area, followed by a number of completely solved problems, along with some problems for the reader to work out. The problem areas are inventory, waiting lines, game theory, linear programing, sequencing, and dynamic programing.

Mathematical models may be written for problem-solving

Each example is stated in such a way that a mathematical model can be written down by the application of elementary reasoning. Solution of the model itself is done (in most cases) by means of routine mathematics. This approach is in contrast

to the case history approach, where the problem and solution are intermixed, and also in contrast to the philosophical approach, which emphasizes universals.

The subject matter for this book arose out of a problem course in Operations Research, designed as a companion course to the general methods course offered at Case Institute of Technology. As such, it is a fitting companion to "Introduction to Operations Research" (DPD, March, 1957, p. 8-9) which has been one of the outstanding books in the field. This present book should be a valuable addition to the OR man's library.

Applications

ROCKWELL STANDARD AXLE SQUEEZES 650

COMPUTING NEWS, June 15, 1959; pages 3-6

Rockwell Standard Transmission and Axle Company, Detroit, is using an IBM 650 with punched card input to process its material control operation. Two cards for each part show, respectively, inventory, and consignment vendor (one who operates on Rockwell rough material). There are two lead times, one for processing, the other for procurement. The cards show part number, order balance, vendor, requirements forecast for five months, history, rough part number and amount of rough finishing will consume, service forecast, minimum run, and gear ratios (which are dropped after gears are chosen). The computer makes the decision on which parts need action, and when. The computer also reports on which parts are recoverable from an assembly in a cancelled or changed order. This is valuable, since loose parts are removed from the inventory count when incorporated in an assembly, and would not be returned to inventory records without this feature of the program.

Computer returns recoverable parts to inventory

The program builds a table of parts requirements for assemblies. Against the table is passed a "where used" file, by part number, showing where and how many times the part is used in the assembly. The computer totals all parts requirements, and summarizes according to final products. Output cards show net requirements by part number. Other card decks are maintained for related functions, such as work-in-process, and summary posting.

CRYSTAL BALLS OR MAGNETIC CORES—THE APPLICATION OF COMPUTERS TO CANADIAN BUSINESS FORECASTING

W. Allan Beckett, University of Toronto
JOURNAL OF MACHINE ACCOUNTING, May 1959; pages 28-30, 45, 46.

Computer programs developed by the U. S. Bureau of Census and National Bureau of Economic Research have revised the traditional concept of our economic system. Although this article is slanted toward Canadian business because it was originally an address to the Canadian Conference for Computing and Data Processing, its points are equally applicable to the United States. The programs described here are reported to have "revealed basic weaknesses in traditional theories and pointed the way toward significant improvements whose value far outweighs the tremendous savings in labor costs[in statistical analysis of business cycles and trends] that are also present. A new and enlarged body of information has been made available for studying and possibly correcting the periodic ebb and flow of prosperity that plagues our kind of economy."

COMPUTER IN THE CORNFIELD

MANAGEMENT AND BUSINESS AUTOMATION, May 1959; pages 26-29.

Pfister Associated Growers, Inc., one of the nation's large hybrid corn seed producers is using an LGP-30 computer to compile research statistics and control its sales order and shipment operation. Use of the computer speeds up results of experimental seed production so that 12 man-years of test data compilations can be performed in two months. Formerly, precious research time was wasted while results were being prepared.

In the sales function, the computer will be able to project future seed requirements from farmers' estimates made early in the season so that the entire sales picture can be tied in with seed production more efficiently.

J. C. PENNEY INSTALLS BANKING-TYPE MACHINES FOR ELECTRONIC BOOKKEEPING

CHAIN STORE AGE, June 1959; page E25

The J. C. Penney Company is using electronic bookkeeping machines, hitherto used only in banking applications, for posting to income and expense records and to accounts payable ledgers. Information and instructions are recorded on magnetic ink strips printed on the reverse sides of ledger sheets. The installation is at the New York office and serves the region's 10,000 vendor accounts.

PURDUE SCHEDULES CLASSES BY COMPUTER

COMPUTING NEWS, June 1, 1959; pages 3, 4

Purdue University is using a Datatron 205 for scheduling students' classes. At the initial run last Fall, the program provided only for sequential scheduling, a program which did not provide for rescheduling of earlier registrants to make room for later students. This program is being further developed to take care of such refinements. The program scheduled 10,000 registrants in 92 hours, compared with 2500 man hours in former years. Average time per student was 31 seconds. By the time a student had paid his fees, after having his choice of classes approved by his advisor, his printed schedule was waiting for him.

Programing

SESAME OPENS THE DOOR TO PROGRAMMING SIMPLIFICATION

UNIVAC REVIEW, Winter 1959; pages 13, 16, 17

((Magnetic tape sorting is an important function in most integrated EDP systems (see DPD, April 1958, page 14; Comment: Sorting). The development of general purpose sorting routines has been carried on by most computer manufacturers. New sorting techniques involve the use of "generators," which generate efficient sort programs for each specific case. The following article discusses how one of the most advanced of current sort generators, SESAME, was developed. It will give the reader some insight into the complexities of this apparently simple operation.))

The development of SESAME (SErvice Sort And MErge) began early in 1957. Its purpose was to capitalize on five years of experience with Univac I sorting to produce efficient and general sorting-merging programs for Univac II.

Goals of the project: optimum speed on random input; increased speed on biased data; optional amounts of first pass own coding; optional last pass own coding; conceptual simplicity and generality; convenience and efficiency in operating detail; ability to exercise options in various parameters, features and techniques.

Collation approach to coding

The collation approach to sorting is practically implied in a generalized computer sorting program, and is not inconsistent with any of the goals mentioned. In this approach, strings of sequenced items are formed on the first data pass, then the number of strings is decreased in subsequent passes until the number is reduced to one.

The project has been divided into three steps: a) analysis and development of specifications, b) programing, systems testing, documentation and distribution of a sort-merge generator.

Sorting, as it usually occurs in a data processing system is preceded and followed by other data processes. These prior processes may have induced some order into the data, and in fact, this may be done at trivial cost. Also the provision for own coding will permit some of the functions that precede the sort to be accomplished in the first pass, and some of the subsequent functions to be incorporated into the last pass.

How it was designed

Decisions which resulted from the analysis and trial coding of step a) were:

1. The first pass would employ replacement selection.

2. The collation passes would include a sequence check on strings.

3. The collation passes would contain a merge that favors selection of an item from string S, where S contributed the last item selected.

4. The collation passes would employ a new input technique, called "Preselected Standby" which eliminates reading hang-up time.

5. The sort-merge generator would be built within the framework of the Flexi-Matic Compiler for Univac II.

The first three decisions reduce the expected time for data with ascending bias and, when considered as a whole, none of these decisions significantly compromise the goal of optimum speed on random input.

Replacement selection. Assume that F items are stored in memory and that the problem is to form an ascending output string. Initially select the lowest key of all, move the corresponding item to output, and replace by an input item to preserve F items in working storage. Iteratively select the lowest key that will fit on the output string, move the corresponding item to output, replace with an item from input--until no more items can be added to the string.

Some advantages

For random input, this method yields strings of expected length 2F items. The shortest possible string (neglecting the terminal string) contains F items. The method yields an unbroken string if no item is preceded by more than F-1 items with higher keys.

This method was found to have three principal advantages: a) on random input and typical item sizes, it forms the longest possible strings out of the first pass, and for all item sizes it appears to form

the longest strings feasible from a processing viewpoint; b) it takes advantage of ascending bias to form longer strings; c) the method lends itself well to variations in available memory space.

Preselected Standby. Consider a collation pass in which the reading time, writing time and processing time are all equal. In a buffered computer such as Univac II, it is desired to read, write and process continually without interruption. The phenomenon known as "reading hang-up" has long barred the full attainment of this goal. Reading hang-up normally occurs when input areas from two or more input tapes are exhausted in rapid succession. SESAME may be used to completely eliminate reading hang-up. The saving gained by this method exceeds twenty per cent for some parameter ranges encountered in collation sorting.

PROGRAMMING FOR DIGITAL COMPUTERS

Joachim Jeenel, Watson Scientific Computing Lab., Columbia University
Published by McGraw-Hill Book Co. $12.00

While this book is aimed at the reader with no previous programing experience, he should at least have some talent for it, and a background of understanding in logical thinking and mathematics. The introductory chapter gives a fairly standard description of the process of data manipulation as it relates to programing. From there the author jumps immediately into a discussion of stored program computers, and the prospective programer is on his way. Chapter 3 begins programing in earnest with memory addressing, followed by Chapters 4 through 9 which cover sequencing, storage and input-output, problem preparation, languages (including pseudo and symbolic coding), operating, testing and checking, and problem planning. Nine appendices present detailed explanations on number systems, scaling, sorting, matrix inversion, optimum programing, and other pertinent subjects. A short bibliography on programing, a glossary and an index complete the book.

A new way of presenting the principles

The author has chosen to write the book for both scientific and commercial programing, and uses examples of mathematical and business problems to illustrate his points. As such, the book might be considered an experiment, since the effectiveness of this approach has not yet been proved. For example, in discussing the important subject of linking of subroutines, the author has used a mathematical example to illustrate the principle involved. The question might be raised: how well will business programers grasp the principle being discussed?

The author has, in general, done a good job in presenting his material and in developing illustrations. The book certainly will take its place among the serious texts on the subject. We observed one area where we felt much more attention should have been given, and

that was the area of the most recent compiling systems, such as Flow-Matic (see DPD, Aug. 1959, page 15). The day of the common computer language has practically arrived, and yet the author has not shown the characteristics, limitations, and powers of these new techniques. For a book published in mid-1959, we believe this to be a definite shortcoming.

General Information

SOME STUDIES IN MACHINE LEARNING USING THE GAME OF CHECKERS

A. L. Samuel
IBM JOURNAL OF RESEARCH AND DEVELOPMENT, July 1959; pages 211-229

This article represents significant research on the way in which a computer can learn by itself to solve a problem. It involves experiments in which a computer teaches itself to play a good game of checkers. "Enough work has been done to verify the fact that a computer can be programmed so that it will learn to play a better game of checkers than can be played by the person who wrote the program." That is, the game represents a familiar learning situation, in which the action of the computer may be observed. The principles of machine learning which are verified by these experiments may be applied to programing and to many other situations.

The experiments involve two learning procedures: 1) by rote--remembering all good moves and consulting the memory when a move is to be made to find what worked in the past. 2) by use of a formula to compute the most effective move out of many alternatives.

The researchers have found that when the computer uses the rote system it can develop a very powerful opening and closing game, but plays the middle game poorly. When it uses the formula, its middle game is good, but its opening and closing games are poor. The researchers believe that "it is now possible to devise learning schemes which will greatly outperform an average person and that such learning schemes may eventually be economically feasible as applied to real-life problems."

PROCEEDINGS OF L.O.M.A. AUTOMATION FORUM

The Proceedings of the Life Office Management Association's Automation Forum are now available. These include the full transcript

of "Can the Contemporary Executive Cope with the Computer Challenge," by E. D. Dwyer, which was digested in DPD, June 1959, page 1. Persons who have had difficulty getting a copy of this interesting talk may get it by ordering the proceedings from L. O. M. A., 110 East 42nd Street, New York 17, N. Y. Price: $8.00 plus 25¢ postage and handling. L. O. M. A. members' price: $5.00 plus 25¢.

AUTOMATION PUTS PRESSURE ON SUPPLY

Pages 69-72

THE COMPUTER DOES EVERYTHING BUT BUY

Pages 73-75, 141
PURCHASING, May 25, 1959

Taken together, these two articles point up the new approach to materials management which the potentials of electronic data processing force management to consider. The first article shows how automated plants force management to provide a continuous supply of materials and eliminate shutdowns caused by delayed delivery or varying quality. These requirements point to the need for a materials management program headed by a member of the top management team, and integrating the production control and purchasing functions.

The second article shows how Sperry Gyroscope's automated inventory control program approaches the service requirements leading toward a goal such as that cited in the first article. At present the Sperry program is applied only to a portion of their inventory--"C" items, low in dollar value but high in volume. This automated inventory system manages an inventory of 12,000 items. It decides when to reorder parts, how many to buy, automatically prints the requisitions along with receiving and routing instructions, examines the company's position on each requisition, and if warranted, prints "Rush" on the papers. The system also prints a weekly catalog of standard parts and hardware, costs, stocks on hand and on order; prints reports on current status of parts on order, and inventory movement.

A METHOD OF CORRECTING ERRORS IN DATA TRANSMISSION

D. W. Hagelbarger, Bell Telephone Laboratories, Inc.
BELL LABORATORIES RECORD, June 1959

The use of telephone lines for the transmission of data has posed a problem in error correction. Telephone circuits always have noise on them, but because of the redundancy of language sounds, these noises do not hamper voice transmission to any

extent. However, data transmission is binary in nature, being a series of on-off signals, and contains little redundancy. Noise pulses may resemble the authentic pulses used to transmit the data, permitting, not just errors, but unnoticed errors. A change of one digit by noise will change the character, which in the case of numbers may change the meaning of the message.

One way of approaching this problem is to increase the redundancy of the digital system by adding extra pulses. A new coding system will correct, not just single errors, but bursts of errors. The new system needs much less expensive encoding and decoding equipment than did previous codes.

In the simplest form of the new coding system, a message is sent as alternate "data" and "check" ((binary)) digits.

To understand how the code works, let us take for an example this code with a redundancy of one-half, designed to correct bursts of six digits or less in length. Operators prepare a message for transmission by sending it through an "encoder" having a shift register capable of holding seven digits at one time. As the message moves through this register, one digit at a time, the equipment selects its check digit according to the value of the data digits that appear in positions one and four of the register at each instant.

Check digit plus data digits equal zero or two

The check digit is chosen to make the sum of it and the two data digits in those positions equal either to "0" or to "2." For example, if data-digit one is "0" and data-digit four is "0," the check digit will be "0" to give a sum of "0." However, if data-digit one is "0" and data-digit four is "1," then the check digit must be a "1" to make a total of "2." Whatever the combination of digits in the first and fourth position, the check digit will be chosen to make the sum of the three of them even. In other words, the "parity"--evenness or oddness--of these three digits will be even.

The check digit is transmitted just before the data digit in position seven of the shift register. All digits in the register move up one place and the encoder generates a new check digit. Thus the message appears on the transmission line as a series of alternate data digits and check digits. Note, however, that adjacent digits are not related. Any check digit is involved with data digits several places later in the message.

Decoding device finds the error

Decoder. At the other end of the transmission line a "decoder" receives the incoming coded message. This machine immediately separates the check digits from the data digits and sends them to two different shift registers. It is at this stage that the equipment determines if any errors have been incurred during transmission. Furthermore, this is where any errors are corrected--the "0's" are changed to "1's" or the "1's" changed to "0's."

The decoder contains two copies of the parity checking circuit. In the first circuit, it checks the parity relationship of the data digits

in positions one and four and the checking digit in position seven. In the second circuit, it checks a similar relationship between data positions four and seven and checking position ten. In the absence of error, of course, the sum will in each case be either "0" or "2"--the parity will be even.

To determine if an error has been made on any one digit, the equipment must look at both parity circuits. If either or both of the two checking patterns show the "expected" digit--that is, even parity relationships--then the digit in position four is correct. If only the second checking pattern shows an error, then the checking digit in position ten is wrong--this however, does not affect the message. Also, if only the first checking pattern shows an error, either the data digit in position one or the checking digit in position seven is wrong. But again no action is necessary because the data digit will be tested again when it reaches position four.

On the other hand, if both circuits show an error, then one has indeed occurred. The equipment corrects this error by changing the data digit in position four as it is shifted to position five. In other words, if neither of the two checking circuits indicates either "0" or "2," then we know that the data digit in position four is wrong and we therefore change it as it moves to position five.

ACCOUNT NUMBERING HELPS PROTECT MERCHANTS AGAINST BOGUS CHECKS

The First National Bank of Buena Vista, Virginia, has sent a bulletin to all local merchants, telling them how to find bogus checks before they are cashed. The bulletin contains a list of account number groups, along with the corresponding last name initials. The merchant compares the account number on the check with the account number list to see if the check has a bona fide account number. The bank has also discontinued giving out counter checks.

PLUGBOARD THINKING

THE ARMED FORCES COMPTROLLER, June 1959; page 11

Col. Roscoe L. Norman, Memphis AF Depot, sees management's penchant for "day-to-day crisis type" of decision-making as being "plugboard thinking," or thinking only in terms of EAM methods. It is almost impossible to make rapid changes in EDP programs. Much longer lead time is required, and the need for stabilization, standardization and consistency of thinking is greater than ever. "Once the system has been implemented, the users should be willing to live with it at least a year."

AUTOMATION AND PERSONAL SERVICE

AUTOMATIC DATA PROCESSING, June 1959; pages 24-29

British banks have proceeded in their study of electronic banking methods in a manner similar to American banks. However, some differences in customer services have kept progress down. For example, British banks include on customers' statements, the name of the payee of each check. Unless this practice is eliminated it could cause some difficulties in an automatic system. British bankers are also opposed to printing the customer's name on his checks. Banks are hesitant, too, because "British people in general are backward in the use they make of banking services." However, some progress is being made, including the design of numerals to be printed in magnetic ink in the same general check area chosen by the American Banking Association. The British system was developed by Electrical and Musical Industries, and is claimed to bear a closer resemblence to conventional Arabic numerals than the American system.

CLASSIFICATION AND CODING TECHNIQUES TO FACILITATE ACCOUNTING OPERATIONS

N.A.A. RESEARCH REPORT 34, published by National Association of Accountants.

Begin the system design with well-planned codes

"The substantial volume of recent writing on office machine applications generally assumes the existence of workable codes. However, in most cases new or improved codes are necessary before the full potential of modern equipment can be realized.... Before data processing machines are selected and operating programs are prepared, objectives in terms of the kinds and amounts of information desired to serve management's purposes need to be established. This analysis will determine the structure and classifications of business information and the resultant codes."

Practices of forty companies are the principal source of information in this report. The information covers types of codes, choice of the right code and introducing it into the system, and example codes for general ledger, sales analysis, cost analysis, products, materials, employee identification, and vendor identification.

A short chapter is devoted to the problems of coding for electronic computer systems. Codes must be selected with the following needs in mind:

1. Classifying by frequency of use to reduce data handling time.
2. Coding to improve use of memory capacity.
3. Devising unique identification symbols with adequate check characteristics.

4. Standardizing codes for use in integrated data processing systems.

The appendix consists of a case study of material requirements planning, showing the coding used by Bell and Howell.

This report presents the need for coding in a logical manner, and gives some good guidance for setting up a coding system. Price: $2.00. Quantity discounts available. Order from National Association of Accountants, 505 Park Avenue, New York 22, New York.

RELECOM—A NEW CONCEPT IN MANAGEMENT CONTROL

M. W. Anderson, T. L. Vallely, Jr.
MANAGEMENT AND BUSINESS AUTOMATION, June 1959; pages 20-23, 48

In the not too distant future, the company which is now studying the total systems approach to data processing may be making use of a method of displaying information from the data processing system at the executive's desk at a moment's notice. One such system--called RELECOM--is described here by its creators. ((Apparently, RELECOM is still in the conceptual stage.)) A cathode tube display screen in the wall would display information in the form of charts or tables on an "in-line" system. Photographic equipment could automatically record the information on the screen if the executive wished to use it in a subsequent conference. Printed reports would continue to emanate from the data processing system for accounting, purchasing, sales, and other departments which need detailed information.

"Several leading manufacturers of electronic equipment are currently developing panel displays for data reporting to top management. It is reasonable to expect that this new communications device will be on the market before many corporations are equipped to use it."

24 STEPS TO ALPHA-NUMERICS

Robert Duphorne, First National Bank, Albuquerque, N.M.
AUDITGRAM, June 1959; pages 16-22

A sequence of steps is given for converting a bank's checking accounts to alpha-numeric system. A warning is given, based on the bank's own experience, that the system will be only as efficient as the ability of the bank personnel to file properly. Some rules for filing are given, taken from the book "Progressive Filing," 1955, Kahn-Yerian, published by Gregg Publishing Division of Mc-Graw-Hill.

((The numbers in this bank's system appear to be entirely numeric, assigned to give an almost perfect alphabetical sort. The

problem of assigning numbers and sorting is not confined to banks, but is of general interest among department stores, manufacturers, and other businesses which require files of identified information. This brief article should be of interest to those concerned with the problem.))

THE LANGUAGE AND SYMBOLOGY OF DIGITAL COMPUTER SYSTEMS

Published by RCA for USAF Cambridge Research Center, 1959

This small volume of 114 pages describes and explains the use of various symbols in electronic digital computers, and serves as a reference in interpreting logic diagrams and technical descriptions of computer circuitry. The book would be useful for the beginning student or one who is working with the technical functioning of a computer system. A short but very good bibliography is included.

POST OFFICE TURNS MODERN

CONTROL ENGINEERING, May 1959; pages 22-24

New equipment and methods are being introduced in post offices all over the country. In the offing are sorters with electronic eyes which may soon read the code on a letter to guide it to its destination. In more advanced systems, machines are being developed to scan typewritten addresses, and further in the future, sorters which can read handwritten addresses.

CURRENT CONTENTS

Current Contents, a monthly publication which reproduces the contents pages of a large number of management and administrative publications, now offers a tear sheet service at a small fee. Subscribers may request an article listed in any of the published contents by filling in a special enclosed tabulating card and sending it to the publisher, Eugene Garfield Associates, 1122 Spring Garden Street, Philadelphia 23, Pennsylvania.

Systems Design

PROCEEDINGS, AIIE ANNUAL MEETING, 1959

High quality editing

The American Institute of Industrial Engineers Annual Meeting Proceedings has a clear, open format, and shows evidence of discriminating editing and elimination of off-the-cuff remarks from the tape recordings. There are several pages on EDP, including an interesting paper by Dr. Grace Murray Hopper, titled "Conversion to Electronic Data Processing." Dr. Hopper opens her talk with this statement: "It is curious that in mentioning a conversion process, most people will describe it as 'manual to punched-card' or 'punched card to magnetic tape,' thus throwing all emphasis on conversion of the data-format. Actually there are three forms of conversion involved: conversion of people, conversion of systems and conversion of data. It cannot be too strongly stated that the first is the most important and that from it the other two derive."

The body of the talk is a step-by-step description of the conversion of data and the conversion to computer operations. These, briefly are:

Data conversion to computer operations

1. Determination of the necessary and the desirable output reports.
2. Defining the source data.
3. Defining the nature of every field of input information.
4. Designing the format for input files, and converting data to new computer media.
5. Change cut-offs and controls over temporary records.
6. Designing and programing of conversion system.
7. Analysis and programing of permanent system.
8. Parallel runs of new and old systems.
9. Retraining of personnel.
10. Gradual cutover to production runs.
11. Continuous learning during the foregoing, by everyone concerned.

Comment

EDP AND THE DISENCHANTED

By Felix Kaufman, Director, Electronic Data Processing, Lybrand, Ross Bros. & Montgomery*

Articles on the assessment of EDP installations began to appear two years ago, with an article in the Harvard Business Review, titled "Never Overestimate the Power of a Computer" ((DPD: October, 1957, p. 4)). Shortly thereafter a set of statistics collected by a consultant was widely publicized. Both Fortune and Business Week published assessment articles ((DPD: December, 1957, p. 1)) which spoke of "false starts and mistakes," attributing them in the main to management errors stemming from the difficulties in spawning and directing a project which has unusual internal implications, places stress on established organizational relationships, and wants skills not provided by the previous experience of people assigned to the task. Bad management was suggested and the accountant's role questioned. Equipment came off relatively unscathed. This is by no means the entire story, and as often as not, has reflected corridor conversations at conventions. The main points developed by this collective assessment are as follows: Most failures are due to bad planning. The equipment by and large has been satisfactory. The manufacturers have oversold the product by exaggerating computer skills and by understating or ignoring costs.

"Bad management, overselling" assessment is based on inconclusive evidence

Most of the judgments have been based on those machines in use in 1957 and early 1958. These were: eleven IBM 702's; 73 IBM 705's; 36 Univac I's; more than 750 IBM 650's; and 81 Datatron 205's. Some interpretations of these statistics are necessary:

1. Of the group of full-fledged machines (with magnetic tape facilities) the IBM 705 was predominant. Since the first delivery of that machine was made early in 1956, the average 705 installation was about 18 months old on January 1, 1959. This is hardly long enough to put an integrated program on the air.

2. Of the group of major machines, about 120 in total, a substantial number were in use by government. In general, these systems are not subject to the same tests of effectiveness as commercial systems and should not participate without extensive qualification in an overall evaluation.

* The full text of this article appears in the <u>California Management Review</u>, Summer 1959, copyright by the Regents of the University of California. The article was presented as a paper before the California Regional Meeting of Systems and Procedures Association, March 20, 1959.

3. Of the group which is largest numerically, the small drum machine, the IBM 650 is dominant. Most of these machines, however, were card-input--card output devices, since systems using magnetic tape were not delivered until 1957.

But why the atmosphere of failure in the absence of conclusive evidence? Perhaps it is due to an air of idealism that is present in most evaluations.

For one thing, all evaluations imply a higher order of competence for managers in general than we really ought to expect.

Sometimes systems man must use computer to push through reforms

Then, there is a widespread acceptance of the proposition that the systems study does more good than the computer. But improvements long overdue sometimes cannot be achieved because of organizational reasons; and a computer program is undertaken as the only effective way to eliminate archaic practices and modernize operations, even though careful analysis would reveal that other methods, perhaps less expensive, would do the job.

Also, it's not an easy task to install an integrated system and the EDP manager may know what he's up to when he uses the "infiltration" method--which means, get the system for modest, undramatic problems and then grow into other things. Since this is the tack the unimaginative will also take, it is a difficult task to discriminate between the bungler and the fellow who proceeds this way deliberately.

In considering the role of equipment, two points are important. First, the experience of a few pioneer users who began with systems we now recognize to have been seriously limited, has been grossly exaggerated by the literature. The problem was compounded by the willingness of these early users to publicize their programs before results were available. Hindsight also tells us that these early users had serious adaptation problems to solve, which they did not recognize, and about which, in a sense, they had a right to do some muddling. Reports about these systems have not put them in the proper perspective considering these problems of equipment and planning.

Card computers just don't bring about big improvements

Second, we have been and still are dominated in numbers of systems by machines which take cards and make cards. These machines are not to be belittled. However, insufficient recognition has been given to their limitations. To begin, they are only important elements in a punch card system. Therefore, they must be utilized in a daring way if they are to seriously alter the existing procedures. Since this is not likely to happen, the justification for these machines rests mainly on the ability to employ them at a lower cost on a given volume of work now being performed by other machines. It is easy to show that these computers can experience considerable difficulty in getting the cost per unit of work down to, or below, the devices they displace.

Conclusions.

1. Evaluations of electronic data processing progress to date are not scientific. They are primarily intuitive and represent a mood rather than a measurement.

Pioneers had a right to muddle through

2. Such disillusionment as currently exists is in some part due to standards of attainment which are too high. We have behaved like perfectionists in our evaluations, without proper regard for the substantial difficulties to be overcome in programs of this kind.

3. Many electronic data processing ventures have been or are unsatisfactory to a greater or lesser extent. This seems to be due to a propensity to mismanage this type of project, probably resulting from an underestimate of the skills required, or an overestimate of the value of other types of experience.

4. Nothing in experience to date points to any inherent weakness in electronic data processing. With costs falling and experience increasing, the future is definitely favorable for the role of the computer.

Training

AMA Systems Courses

Unit I:	September 14-18, 1959 Sheraton Palace Hotel, San Francisco
Unit II:	October 26-30, 1959 Ambassador Hotel, Los Angeles
Unit III:	November 30 - December 4, 1959 Ambassador Hotel, Los Angeles
Information:	Andrews M. Lang, American Management Association Academy, Saranac Lake, New York

Information Storage and Retrieval

Date:	September 28--October 9, 1959
Place:	University of California, Los Angeles, Extension Division
Fee:	$150
For whom:	Special libraries, equipment manufacturers, research activities, data processing people, military
Information:	Extension, University of California, Los Angeles 24, California

Management Concepts in Operations Research
Date: October 19-21, 1959
Place: Boston, Mass. (Harvard Club)
Fee: $200
Information: Harvey N. Shycon Co., Park Square Building, Boston, Massachusetts

Engineering and Management Course
Date: January 25--February 4, 1960
Place: University of California, Los Angeles
Fee: $400
Information: College of Engineering, University of California, Los Angeles 24, California

COLLEGE COURSES

Fundamentals of Coding for Automatic Digital Computers (1st semester)
Advanced Techniques in Coding for Automatic Digital Computers (2nd semester)
Time: Wednesdays, 7:00-9:30 P.M.
Place: University of California, Los Angeles, Extension

Computer Programming; Operations Research in Management
Place: The American University, Washington 16, D. C.

Introduction to EDP Systems; Planning Computer Applications; Machine Computation; Principles of Data Collection and Tabulation
Place: Sacramento State College, Sacramento, California

Meetings

Bendix G-15 Users Exchange Organization
Date: September 16-18, 1959
Place: Palo Alto, California

ISA Conference: "World Progress in Instrumentation"
Date: September 21-25, 1959
Place: Chicago, Illinois
Information: Instrument Society of America, 313 Sixth Avenue, Pittsburgh 22, Pennsylvania

Industrial Electronics Symposium, sponsored by IRE (PGIE), and AIEE

Date: September 30--October 1, 1959

Place: Pittsburgh, Pennsylvania (Mellon Institute)

Theme: Electronics Comes of Age in Industry

Information: Publicity Chairman, Robert H. Delgado, 954 Brentview Drive, Pittsburgh 36, Pennsylvania

1959 International Systems Meeting, Systems and Procedures Association of America

Date: October 12-14, 1959

Place: Toronto, Ontario (Royal York Hotel)

Information: Systems and Procedures Association, 4463 Penobscot Building, Detroit 26, Michigan

Equipment Systems Conference and Exhibit, sponsored by The Navy, City and County of San Diego, local colleges, schools, and professional organizations

Date: October 28-30, 1959

Place: San Diego, California (Conference Building, Balboa Park)

Information: Equipment Systems Conference, c/o H. J. Anderson Company, 1825 El Cajon Blvd., San Diego 3, California

Operations Research Society of America National Meeting

Date: November 11-13, 1959

Place: Pasadena, California (Huntington Sheraton Hotel)

Information: ORSA, Mt. Royal and Guilford Aves., Baltimore 2, Maryland

Eastern Joint Computer Conference

Date: December 1-3, 1959

Place: Boston, Massachusetts (Statler Hilton Hotel)

Conference on Automatic Computing and Data Processing in Australia, sponsored by the Australian National Committee on Computation and Automatic Control

Date: May 24-27, 1960

Place: University of Sydney and University of New South Wales

Information: C. H. D. Harper, Secretary, Australian National Committee on Computation and Automatic Control, c/o The Institution of Engineers, Science House, 157 Gloucester Street, Sydney, Australia

References

The publishers of books and periodicals mentioned in this issue of DATA PROCESSING DIGEST are listed below for your convenience in writing to them for more complete information.

American Institute of Industrial Engineers
145 North High Street
Columbus 15, Ohio

Armed Forces Comptroller
516 North Oxford Street
Arlington 3, Virginia

Auditgram
38 South Dearborn Street
Chicago 3, Illinois

Automatic Data Processing
Mercury House
109-119 Waterloo Road
London SE 1, England

Bell Laboratories Record
195 Broadway
New York 7, New York

Business Horizons
School of Business
Indiana University
Bloomington, Indiana

Chain Store Age (Admin. Ed.)
2 Park Avenue
New York 16, New York

Computing News
Box 90424, Airport Station
Los Angeles 45, California

Control Engineering
330 West 42nd Street
New York 36, New York

IBM Journal of Research and Development
590 Madison Avenue
New York 22, New York

Journal of Machine Accounting
208 South Main Street
Paris, Illinois

McGraw-Hill Book Co., Inc.
330 West 42nd Street
New York 36, New York

Management and Business Automation
600 West Jackson Blvd.
Chicago 6, Illinois

Navy Management Review
Supt. of Documents
U.S. Government Printing Office
Washington 25, D. C.

Purchasing
205 East 42nd Street
New York 17, New York

Univac Review
Remington Rand Univac Div.
315 Fourth Avenue
New York 10, New York

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

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